This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently amended):   A computer-implemented method for automatically tuning a feedforward compensation parameter in a motion control system, the method comprising:

a)   determining an initial value of the feedforward compensation parameter;

b)   commanding an initial movement of an actuator according to a test motion routine, wherein the initial value of the parameter is used in the control of the actuator;

c)   determining error associated with the initial movement;

d)   determining a potential value of the feedforward compensation parameter;

e)   commanding a movement of the actuator according to the test motion routine, wherein the potential value of the parameter is used in the control of the actuator;

f)   determining error associated with the movement commanded in act e);

g)   comparing the errors associated with the movements;

h)   based on the act of comparing the errors, selecting one of the values as a current best value; and

i)   repeating acts d) - h) until the current best value is an optimum value, wherein the act of comparing the errors associated with the movements comprises comparing the errors associated with at least two of the movements.;

wherein the feedforward compensation parameter comprises at least one parameter selected from the group consisting of an acceleration feedforward gain, a Coulomb friction feedforward gain, a viscous friction feedforward gain and a constant offset feedforward gain.

Claim 2 (Previously presented):   A method according to claim 1, wherein the feedforward compensation parameter being tuned is one of a plurality of feedforward compensation parameters comprising other feedforward compensation parameters, further comprising using optimum values determined for the other feedforward compensation parameters in the control of the actuator for the commanded movements.

Claim 3 (Currently amended):   A method according to claim 2, wherein the other feedforward compensation parameters being tuned comprises at least parameter selected from the group consisting of a time-shift parameter, and the other feedforward compensation

~~parameters comprise at least one parameter selected from the group consisting of an acceleration feedforward gain, a Coulomb friction feedforward gain, a viscous friction feedforward gain, a constant offset feedforward gain,~~ a proportional gain, and an integral gain.

Claim 4 (Original):   A method according to claim 2, further comprising determining the optimum values for the other feedforward compensation parameters prior to commanding any of the movements.

Claim 5 (Cancelled).

Claim 6 (Previously presented):   A method according to claim 1, wherein the test motion routine is associated with a sinusoidal waveform.

Claim 7 (Original):   A method according to claim 1, wherein the acts of determining error comprises determining a following error.

Claim 8 (Original):   A method according to claim 1, wherein the act of comparing the errors comprises comparing an average of the root means squared value of each of the errors.

Claim 9 (Original):   A method according to claim 1, wherein the act of determining a potential value for the feedforward compensation parameter comprises using a technique based on a minimization algorithm to determine the potential value.

Claim 10 (Cancelled).

Claim 11 (Previously presented):   A method according to claim 1, wherein the act of determining whether the current best value is the optimum value comprises:

    a)   identifying which of the values is a second best value;
    b)   determining whether there is a percentage change between the second best value and the current best value.

Claim 12 (Previously presented):   A method according to claim 1, wherein the act of determining whether the current best value is the optimum value comprises:

a)   identifying which of the values is a second best value; and

b)   determining whether there would be any difference between using the current best value and the second best value.

Claim 13 (Cancelled).

Claim 14 (Currently amended):   A computer-implemented motion control system comprising:

a)   a position command generator adapted to produce position commands;

b)   a feedforward command generator adapted to produce feedforward commands based upon feedforward compensation parameters, wherein one of the feedforward compensation parameters comprises a time-shift compensation parameter that compensates for a time-shifted relationship between the position command and the feedforward command at least one parameter selected from the group consisting of an acceleration feedforward gain, a Coulomb friction feedforward gain, a viscous friction feedforward gain and a constant offset feedforward gain;

d)   a controller adapted to communicate with an actuator, the position command generator, and the feedforward command generator, and adapted to control the motion of the actuator based upon the position commands and the feedforward commands; and

e)   a feedforward tuning unit adapted to:

i)   determine an initial value of the time-shift feedforward compensation parameter;

ii)   cause the position command generator to produce position commands according to a test motion routine, wherein the initial value of the time-shift feedforward compensation parameter is used in the control of the actuator and the actuator undergoes an initial movement;

iii)   determine error associated with the initial movement;

iv)   determine a potential value of the time-shift feedforward compensation parameter;

v)   cause the position command generator to produce position commands according to the test motion routine, wherein the potential value of the time-shift

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feedforward compensation parameter is used in the control of the actuator and the actuator undergoes movement;

     vi)   determine error associated with the movement wherein the potential value was used in the control of the actuator;

     vii)   compare the errors associated with the movements;

     viii)   select one of the values as a current best value based on the comparison; and

     ix)   repeat actions in iv) - viii) until the current best value is an optimum value, wherein the feedforward tuning unit compares the errors associated with at least two of the movements.

Claim 15 (Previously presented):   A motion control system according to claim 14, wherein the feedforward tuning unit is adapted to communicate with at least one of the actuator, the controller, the position command generator, and the feedforward command generator via a data communication network and in compliance with a communications protocol.

Claim 16 (Previously presented):   A motion control system according to claim 15, wherein the communications protocol is a hypertext transfer protocol.

Claim 17 (Previously presented):   A motion control system according to claim 14, wherein the position command generator, the feedforward command generator, and the feedforward tuning unit are incorporated within a computer numerical control unit and the controller comprises a servocontroller.

Claim 18 (Original):   A motion control system according to claim 14, wherein the feedforward tuning unit comprises a finite state machine.

Claim 19 (Currently amended):   A computer readable medium comprising instructions capable of implementing a method of running a feedforward compensation parameter in a motion control system, the method comprising:

     a)   determining an initial value of the feedforward compensation parameter;

     b)   commanding an initial movement of an actuator according to a test motion routine, wherein the initial value of the parameter is used in the control of the actuator;

c)   determining error associated with the initial movement;

d)   determining a potential value of the feedforward compensation parameter;

e)   commanding a movement of the actuator according to the test motion routine, wherein the potential value of the parameter is used in the control of the actuator;

f)   determining error associated with the movement commanded in act e);

g)   comparing the errors associated with the movements;

h)   based on the act of comparing the errors, selecting one of the values as a current best value; and

i)   repeating acts d) - h) until the current best value is an optimum value, wherein the act of comparing the errors associated with the movements comprises comparing the errors associated with at least two of the movements-;

wherein the feedforward compensation parameter comprises at least one parameter selected from the group consisting of an acceleration feedforward gain, a Coulomb friction feedforward gain, a viscous friction feedforward gain and a constant offset feedforward gain.

Claim 20 (Cancelled).

Claim 21 (New):   A computer-implemented motion control system comprising:

a)   a position command generator adapted to produce position commands;

b)   a feedforward command generator adapted to produce feedforward commands based upon feedforward compensation parameters, wherein one of the feedforward compensation parameters comprises a time-shift compensation parameter that compensates for a time-shifted relationship between the position command and the feedforward command;

d)   a controller adapted to communicate with an actuator, the position command generator, and the feedforward command generator, and adapted to control the motion of the actuator based upon the position commands and the feedforward commands; and

e)   a feedforward tuning unit adapted to:

i)   determine an initial value of the time-shift compensation parameter;

ii)   cause the position command generator to produce position commands according to a test motion routine, wherein the initial value of the time-shift compensation parameter is used in the control of the actuator and the actuator undergoes an initial movement;

iii)   determine error associated with the initial movement;

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iv)   determine a potential value of the time-shift compensation parameter;

v)   cause the position command generator to produce position commands according to the test motion routine, wherein the potential value of the time-shift compensation parameter is used in the control of the actuator and the actuator undergoes movement;

vi)   determine error associated with the movement wherein the potential value was used in the control of the actuator;

vii)   compare the errors associated with the movements;

viii)   select one of the values as a current best value based on the comparison; and

ix)   repeat actions in iv) - viii) until the current best value is an optimum value, wherein the feedforward tuning unit compares the errors associated with at least two of the movements; and

wherein the feedforward tuning unit comprises a finite state machine.